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*The Reporter is published by the Massachusetts Department of Public Health, Division of Food and Drugs, Food Protection Program and the Division of Community Sanitation. For further information on these and other topics, Food Protection Program staff may be reached by calling 617-983-6712 and Division of Community Sanitation staff may be reached by calling 617-983-6762.*

*This publication is sent to all Boards of Health in the Commonwealth. It is requested that a copy be circulated to all board members and interested employees. Other interested individuals and agencies may request a copy by contacting the Editor.*

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# Letter from the Directors:

Richard D. Waskiewicz, M. S., Division of Food and Drugs, Food Protection Program  
Howard S. Wensley, M.S., C.H.O., Division of Community Sanitation



Spring season is a busy time at the Division of Food and Drugs' Food Protection Program and the Division of Community Sanitation as staff prepare for a variety of projects which must be completed during the summer months. It is only within the two-three months of the summer season that particular facilities are open and operating, and food products are being harvested and processed.

A few of the projects which staff are currently designing and scheduling include the inspection of summer feeding programs, swimming pools, bathing beaches, and recreational camps, as well as the collection of fresh produce for pesticide residue testing. Also, it is during these warmer months that there is an increased risk for foodborne illnesses, and food safety education and inspection and surveillance are essential.

During the last year, there have been significant foodborne illness outbreaks in Massachusetts. This issue of THE REPORTER includes articles about four foodborne illnesses. The Working Group on Foodborne Illness Control's final report of the 1998 *E. Coli* O157:H7 outbreak involving ground beef is included in this issue. This is the first time a Working Group report has been included in THE REPORTER. Also, the Centers for Disease Control and Prevention (CDC) publication, Mortality and Morbidity Weekly Report (MMWR), published a report about a *Shigella sonnei* outbreak associated with fresh parsley which effected not only citizens in Massachusetts, but also in Minnesota, California, and Canada. The MMWR also recently included an article about the two incidents of potential mass exposure to rabies through drinking unpasteurized milk that have occurred since 1996 in Massachusetts.

In the Fall 1998 edition of THE REPORTER, Priscilla Neves, R.S. reported about four cases of ciguatera fish poisoning from barracuda. Since the publication of this report, two additional cases are being investigated in Massachusetts. These cases prompts the FPP to include a fact sheet about this toxin poisoning and alert boards of health of this illness.

Since the Fall of 1998, the media have presented a number of news items about the bacterium *Listeria*. In Massachusetts there have been reported cases associated with prepared meats, and the Food Protection Program has worked closely with other Programs and Divisions within the Massachusetts Department of Public Health (MDPH) and with the CDC tracing the sources of illness caused by a rare strain of the bacterium *Listeria monocytogenes*, serotype 4b, which nation-wide has resulted in more than 50 reported illnesses, six adult deaths, and two pregnant women having spontaneous abortions. Together these local, state, and federal agencies have identified the vehicle for transmission as hot dogs and possibly deli meats produced under many brand names by one manufacturer. This cooperation resulted in a nation-wide recall. At present, no final report has been released.

The Food Protection Program and the federal Food and Drug Administration will present a four-day course titled: "Food Code: Train the Trainer." This course will be held from September 13-17, 1999 in Worcester, Massachusetts. Additional course and contact information is presented on page 28.

During the summer, several college interns, trained by the Division of Community Sanitation, will be inspecting recreational camps for children. The inspectional goal for this summer staff will be the inspection of fifty percent of the more than 600 camps registered in the Commonwealth. These inspections will **not** alter the regulatory responsibilities of the local boards of health, which includes the annual inspection and licensing of all camps within their jurisdiction. We hope that Board of Health members and/or staff will be able to arrange their work schedules to accompany these people during the actual inspections.

Last year 75 camps were inspected by state summer inspectors. Overall, the camps smoothly passed inspection, although swimming pool operations were the greatest public health concern. It is imperative that local boards of health perform timely inspections of seasonal recreation camps in order to assure the health and safety of these facilities.

Additionally, as of January 1, 1999, all pool supervisors must meet the new requirements, *Minimum Standards for Swimming Pools, State Sanitary Code*, Ch. V, 105 CMR 435.17(2), including receiving pool operator certification. Local boards of health are strongly encouraged to remind all pool supervisors in their jurisdiction of this regulation.

In response to questions from health departments and swimming pool operators, two inspectors in the Division compiled a guideline for the safe handling and storage of swimming pool chemicals. (See page 33.)

The advisory committee on bathing beach quality (105 CMR 445.000, *Minimum Stan-*

*dards for Bathing Beaches*) will continue to review and revise these regulations with the goal of presenting proposed amendments in Winter 1999.

Finally, the Division of Community Sanitation distributed a survey to all health departments throughout the Commonwealth as well as Massachusetts District Commission (MDC) and Department of Environmental Management (DEM) fresh water bathing beaches supervisors. The survey will contribute to the gathering of information about bathing beach water quality.

The survey was distributed by mail, and was also available on the MDPH Internet HomePage (<http://www.state.ma.us/dph/dcs/h20surv.htm>). Presently, one third of the surveys have been completed. Staff have begun entering the data into a data base, and will be making direct contact with non-respondents. Data collected from the survey will be used in writing the revisions to 105 CMR 445.000 and establishing a state-wide data base.

Erica Berl, D.V.M. has joined the Food Protection Program as a Public Health Veterinarian and the Foodborne Illness Coordinator. After nine years of clinical practice, Dr. Berl is refocusing her career to work more directly on public health issues. David E. Nabreski was hired by the FPP as a Senior Food and Drug Inspector in the Food Processing Unit. Alfred Scoglio, Supervisory Inspector of the Dairy Inspection Unit, retired from state service, and Larry Ramdin, Senior Inspector in the Food Processing Unit has joined the private sector. ❖



# ***E. coli* O157:H7 Cases Massachusetts, June-August 1998 Two Multi-state Clusters**

***Massachusetts Working Group on Foodborne Illness Control***

## **I. Summary**

During the summer of 1998, an increase in reported cases of *Escherichia coli* O157:H7 was observed throughout Massachusetts. Cases were reported with no apparent geographic or temporal clustering. Epidemiologic, laboratory and environmental investigations identified three major clusters of illness. Two clusters were identified through laboratory means alone and the third through both epidemiologic and laboratory means. An investigation of cases of *E. coli* O157:H7 throughout the New England states was initiated with on-going communications between health departments, the Centers for Disease Control and Prevention (CDC), and the US Department of Agriculture (USDA). A common food source, commercially distributed ground beef, was identified as a vehicle in one cluster. The source for the second cluster remains unknown. The third cluster was associated with a restaurant and is described in the attached report.

## **II. Introduction**

From June 1, 1998 through August 31, 1998, the Enteric Laboratory at the State Laboratory Institute (SLI) confirmed 85 cases of *E. coli* O157:H7. This number of cases was a 1.4-fold increase over cases reported during the same time period in 1997 (n = 36), but a 13 percent decrease from the same time period during 1996 (n = 98). The Epidemiology Program was notified by the Enteric Laboratory of an increase in positive specimens in early June. The increase was observed to have begun a few days following an *E. coli* O157:H7 teleconference for laboratorians during which they were encouraged to submit isolates of *E. coli* O157:H7 to the SLI for confirmation. Even though it first appeared that the increase was an artifact of increased isolate submission, the

Working Group on Foodborne Illness Control initiated an investigation.

## **III. Methods and Results**

### ***Epidemiologic***

Upon recognition of an increase in cases of *E. coli* O157:H7, a questionnaire was developed for administration to all cases. The questionnaire collected information regarding the cases' food and activity histories during the two weeks prior to illness. Specific questions were included regarding ground beef consumption, ground beef purchase, and location of ground beef purchase.

Neighboring states were queried regarding the occurrence of *E. coli* O157:H7 in their communities. Through conversations with health department personnel in surrounding states it became apparent that an increase in *E. coli* O157:H7 cases was also occurring at a regional level. Connecticut and New Hampshire initially reported an increase in cases, and ultimately Vermont, Maine, New York and Rhode Island identified cases related to the clusters. In order to facilitate the sharing of information between the New England states, on June 10, 1998, a series of conference calls commenced. These calls included representatives from the CDC, the USDA, and state health departments (Massachusetts, Connecticut, Rhode Island, Vermont, New Hampshire, Maine, and New Jersey).

Genetic analysis of isolates from the Massachusetts cases identified three clusters of genetically indistinguishable patterns as well as a number of other unique genotypes.

### **CLUSTER 1**

The first pattern (designated A1 for the purposes of this report) was seen in 20 human cases. Seventeen of these cases were interviewed and five reported purchasing ground beef from Company A. One of these cases submitted a ground beef sample purchased from Company A to the SLI for bacterial testing.

#### CLUSTER 2

The second pattern (designated A2 for the purposes of this report) was observed in nine human cases. All nine cases were interviewed; five reported purchasing ground beef from Company B and one case reported purchasing ground beef from a Company C. Three of these cases submitted ground beef samples to the SLI for bacterial testing.

#### CLUSTER 3

The third pattern (designated A3 for the purposes of this report) was seen in isolates from four cases. This cluster also revealed temporal and geographic clustering, was linked to a restaurant, and is described in the attached report (*E. coli* O157:H7 cases, MA; Cluster of illness in Methuen, MA).

The questionnaire administered to cases revealed no other food item or activity to be a significantly associated with illness.

### **Environmental**

#### GROUND BEEF TESTING—CASE SAMPLES

Samples of ground beef were obtained from case-patients. Six submitted left-over ground beef samples from beef eaten during their incubation periods. *E. coli* O157:H7 was isolated from two samples submitted by two cases-patients. Both isolates were from cases who had the A2 PFGE pattern and both isolates from the ground beef were the A2 PFGE pattern. One of the positive samples of ground beef had been purchased at a Company B Market, the second at a Company C. Both the Company C and the Company B Market received beef from Company X, a wholesale meat supplier in Wisconsin. Company B re-

ceived meat directly from Company Z, and Company C received meat from Company Z through Company X, a wholesale distributor in Massachusetts.

In addition, consumer's samples of ground beef purchased from a Company B Market in New Hampshire were also found to be contaminated with *E. coli* O157:H7 (A2 PFGE pattern). For more information regarding the New Hampshire cases and food isolates, contact the New Hampshire Department of Health, Communicable Disease Control at 603-271-4496.

#### GROUND BEEF TESTING—STORE SAMPLES/CONSUMER SAMPLES

A total of 64 samples of ground beef were collected from retail establishments or consumers by the Massachusetts Division of Food and Drugs (DFD) and local boards of health between June 12 and August 17, 1998 (see Attachment 1). Samples were tested for the presence of *E. coli* O157:H7 by the SLI Food Microbiology Laboratory and isolates of *E. coli* O157:H7 found were subjected to PFGE by the SLI PFGE Laboratory. (See report on page 12.)

*RETAIL SAMPLES* (Massachusetts and New Hampshire ground beef samples = 53; Massachusetts stores sampled = 12; New Hampshire stores sampled = 2)

#### *Company B*

- The DFD collected 17 ground beef samples from five Company B stores. *E. coli* O157:H7 was not found in any of these 17 samples.
- Company B provided the MDPH with 25 ground beef samples collected from the Keene, NH, Company B store. *E. coli* O157:H7 was found in two of these 25 samples.

#### *Company C*

- The DFD collected one ground beef sample from a Company C store. *E. coli* O157:H7 was not found in this sample.

#### *Company A*

- The DFD collected seven ground beef samples from four Company A stores. *E. coli*

O157:H7 was not found in any of these seven samples.

#### *Other*

- The DFD collected two ground beef samples from Company Z. *E. coli* O157:H7 was not found in either of these two samples.
- The DFD collected one ground beef sample from a Company D. *E. coli* O157:H7 was not found in this sample.

*CONSUMER SAMPLES* (Massachusetts ground beef samples = 11; Massachusetts consumers submitting samples = 6)

#### *Company B*

- Two consumers from MA submitted one ground beef sample each purchased from two Company B stores for testing. *E. coli* O157:H7 was found in one of these two samples.
- One consumer from New Hampshire submitted one ground beef sample purchased at a Company B store in New Hampshire for testing. *E. coli* O157:H7 was not found in this sample.

#### *Company C*

- One consumer submitted three ground beef samples purchased at a single Company C store for testing. *E. coli* O157:H7 was found in one of these three samples.

#### *Company A*

- Three consumers submitted five ground beef samples purchased at three different Company A store for testing. *E. coli* O157:H7 was not found in any of these five samples.

#### *TRACE-BACK OF GROUND BEEF*

A trace-back on the ground beef purchased at Company B and Company C was undertaken by the DFD. A traceback to identify the exact lot of beef used for each suspect sample was not possible.

Tracebacks for ground beef are particularly difficult because of the co-mingling of various meats at the retail level, the number of different lean contents available, and the quick turnover. The only common factor between the two positive retail samples from Company B

and Company C is that both chains used meat from Company X, a wholesale meat supplier in Wisconsin, in their ground beef production. Company X directly shipped meat to each Company B. Company C received the meat through Company Z. The meat is received at retail in cryovac packaging.

The USDA has not yet provided the DFD with any follow-up information relative to the Company X plant in Wisconsin.

#### *GROUND BEEF RECALLS*

As the result of an *E. coli* O157:H7 positive specimen of ground beef being identified from Company B, Company B voluntarily recalled fresh ground beef with sell-by dates between May 9, 1998 and June 6, 1998 and store-produced frozen ground beef with a sell-by-date up to July 6, 1998. This recall affected 124 Company B stores throughout the New England states. A press release was issued on June 12, 1998.

In addition, as the result of *E. coli* O157:H7 being found in the Company C consumer beef sample, Company C issued a store-specific recall of ground beef from the Marshfield, MA store on June 25, 1998. The recall affected 85 percent fresh and frozen ground beef with a sell-by date of May 23, 1998.

#### *Laboratory*

All of the patient and ground beef sample isolates were confirmed as *E. coli* O157:H7 by the Enteric Laboratory at the SLI. PFGE was performed on all *E. coli* O157:H7 isolates confirmed by the Enteric Laboratory, as well as on isolates submitted to the SLI by other states.

#### *PFGE*

Isolates were digested with Xba I and electrophoresed using the 24-hour protocol developed by the CDC and the Washington State Health Department. PFGE performed on all 85 isolates revealed 42 genetic patterns.

Thirty-two single patterns, four patterns with two cases each, two patterns with three cases each, and one cluster of five cases (with no temporal or geographic links), and one cluster of four cases (with temporal and geographic links) were identified. In addition, two major clusters of indistinguishable genetic patterns were noted. Descriptions of each of the two major clusters and one cluster of four identical isolates are provided below.

#### **Cluster 1 (PFGE pattern A1): Massachusetts/Connecticut**

Massachusetts: N=20 human cases

The first cluster of cases was identified through PFGE of the isolates. No geographic or temporal clustering of these cases was observed. Cases were reported from 17 towns; onsets of illness from ranged from May 23, 1998 to August 7, 1998 (onset dates known for 15 of 20 cases; see Figure 1); case ages ranged from 2 to 68 years (median = 10 years; age known for 19 of 20 cases). Case inter-

PFGE Pattern	Number of cases
Single Pattern	32
Two isolates with same pattern	4 sets of 2 cases
Three isolates with same pattern	2 sets of 3 cases
Five isolates with the same pattern	1 set of 5 cases
Four isolates with the same pattern	1 set of 4 cases
Cluster 1 (A1 pattern)	20 cases
Cluster 2 (A2 pattern)	9 cases

views revealed five cases who had consumed ground beef purchased at Company A during their incubation periods. One case with this PFGE pattern submitted left-over ground beef purchased from Company A for *E. coli* O157:H7 testing. *E. coli* O157:H7 was not found in this ground beef sample. No other common source of exposure was identified for these cases.

Surrounding states including Connecticut, Vermont and Rhode Island also identified cases of *E. coli* O157:H7 with the same genetic pattern during the same time period. No common source of exposure was identified for

these cases.

#### **Cluster 2 (PFGE pattern A2): Massachusetts/Company B/Company C**

N=9 human cases; N 2 ground beef isolates

The second major cluster of cases was also identified through PFGE of isolates. No geographic or temporal clustering of these cases was observed. Cases were reported from nine towns; onsets of illness from ranged from May 25, 1998 to June 23, 1998 (see Figure 2); case-patient ages ranged from 4 to 82 years (median = 39 years). Seven of nine reported consuming ground beef in the two weeks prior to onset of symptoms. Of these seven cases, five purchased ground beef at Company B, one at a Company C, and one purchased beef from an unknown source. Three of those seven submitted ground beef samples for *E. coli* O157:H7 testing. *E. coli* O157:H7 was cultured from two of the three samples submitted to the SLI. PFGE of the two isolates found in the ground beef samples revealed PFGE patterns indistinguishable from the case isolates and from each other. The ground beef was purchased at two different grocery store chains and product recalls were issued (see the Environmental section above for details).

In addition, cases of *E. coli* O157:H7 with the same PFGE pattern were seen in surrounding states including New Hampshire. The New Hampshire Department of Health submitted *E. coli* O157:H7 isolates to the SLI for PFGE. These isolates included a ground beef sample purchased from a Company B Market in New Hampshire. PFGE of these isolates revealed a genetic pattern indistinguishable from cases and ground beef isolates in Massachusetts (as well as cases in Maine and Rhode Island).

**Cluster 3: Town cluster, restaurant associated.** N=4 human cases.

This cluster of four cases was identified by a geographic and temporal clustering of cases and was confirmed through PFGE of isolates.

**Note:** Five cases were found to be indistinguishable from each other through PFGE; however, no geographic or temporal links were observed between these five cases. No epidemiologic connections were found upon interview.

#### IV. Discussion

From June through August 1998 there was an increase in reported cases of *E. coli* O157:H7 in Massachusetts. Advanced genetic testing of isolates combined with case investigations revealed that 60 percent (51/85) of the cases seen during this time period were sporadic cases of disease. However, 40 percent of the cases could be linked through epidemiologic and/or laboratory means to three clusters.

This increase in reported cases of *E. coli* O157:H7 was also seen on a regional level and highlights the importance of ongoing communications between state health departments. The investigation of a multi-state outbreak of illness can prove challenging and requires coordination and cooperation. The use of the PulseNet system facilitated the exchange of laboratory information essential for the rapid identification of indistinguishable genetic strains of organisms. The PulseNet system allows a comparison of all strains of *E. coli* O157:H7 recently submitted from throughout the country. Direct communication between the CDC, the USDA, the federal Food and Drug Administration, and the other regional PFGE laboratories reduces the time necessary to identify and confirm an outbreak. In addition, the PulseNet system allows historical tracking of specific stains of *E. coli* O157:H7.

The investigation of these multi-state clusters also identified some of the difficulties encountered when attempting to trace-back food products from multiple sources in multiple

states. The only common factor identified between the two positive retail samples from Company B and Company C is that both chains used meat from Company X, a wholesale meat supplier in Wisconsin, in their ground beef production. The USDA has not yet provided the DFD with any follow-up information relative to the Company X plant in Wisconsin. Rapid and detailed communication of environmental findings is needed in investigations involving multiple jurisdictions.

Finally, the fact that a definitive source of infection for one of the clusters was not identified emphasizes the need to look not only at the traditional high-risk foods/activities associated with *E. coli* O157:H7, but also at non-traditional sources. Recent outbreaks linked to commercial lettuce products and a “kiddie” pool at a water park emphasize the need to explore any and all leads when attempting to identify the source of *E. coli* O157:H7.

This report was prepared by the Massachusetts Working group on Foodborne Illness Control. It was completed and distributed on March 5, 1999. With the exception minor editorial changes and formatting, the report is presented in its entirety. ❖

**E. Coli O157:H7  
Ground Beef Testing  
Summer 1998**

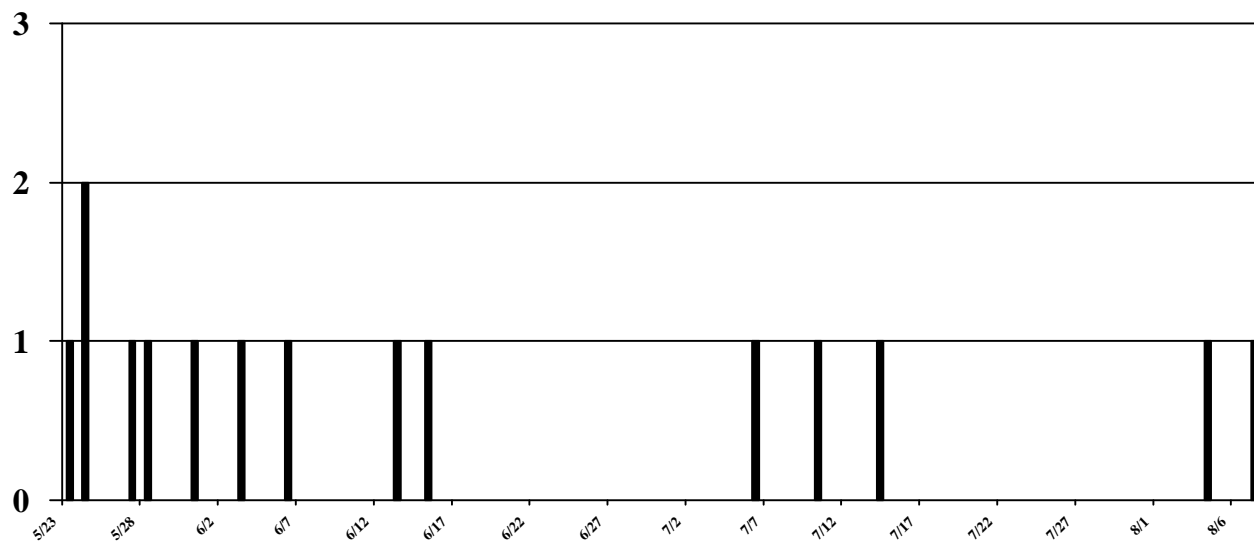
SOURCE	TOWN	DATE TO SLI	SUBMITTER	RESULT	NO. SAMPLES
Company X	Roxbury	6/16/98	DFD	2NF	2
Company D	Saugus	6/17/98	DFD	NF	1
Company B	Easton	6/16/98	Consumer	1+	1
Company B	Easton	6/16/98	DFD	NF	1
Company B	Beverly	6/17/98	DFD	NF	1
Company B	Worcester	6/18/98	Consumer	NF	1
Company B	Stoneham	7/1/98	DFD	NF	1
Company B warehouse	Methuen	6/16/98	DFD	9 NF	9
Company B	New Bedford	8/17/98	DFD	5 NF	5
Company B	Keene, NH	6/15/98		2+, 23NF	25
Company B	Salem, NH	6/23/98	Consumer	NF	1
Company C	Marshfield	6/12/98	Consumer	1+, 2NF	3
Company C	Gloucester	6/17/98	DFD	NF	1
Company A	New Bedford	6/16/98	Consumer	2NF	2
Company A	Boston	6/16/98	DFD	4NF	4
Company A	Revere	6/17/98	Consumer	2NF	2
Company A	Beverly	6/17/98	DFD	NF	1
Company A	Gloucester	6/17/98	DFD	NF	1
Company A	Lynn	6/17/98	DFD	NF	1
Company A	Fairhaven	7/13/98	Consumer	NF	1
					N=64

DFD = Massachusetts Division of Food and Drugs

NF = *E. coli* O157:H7 not found

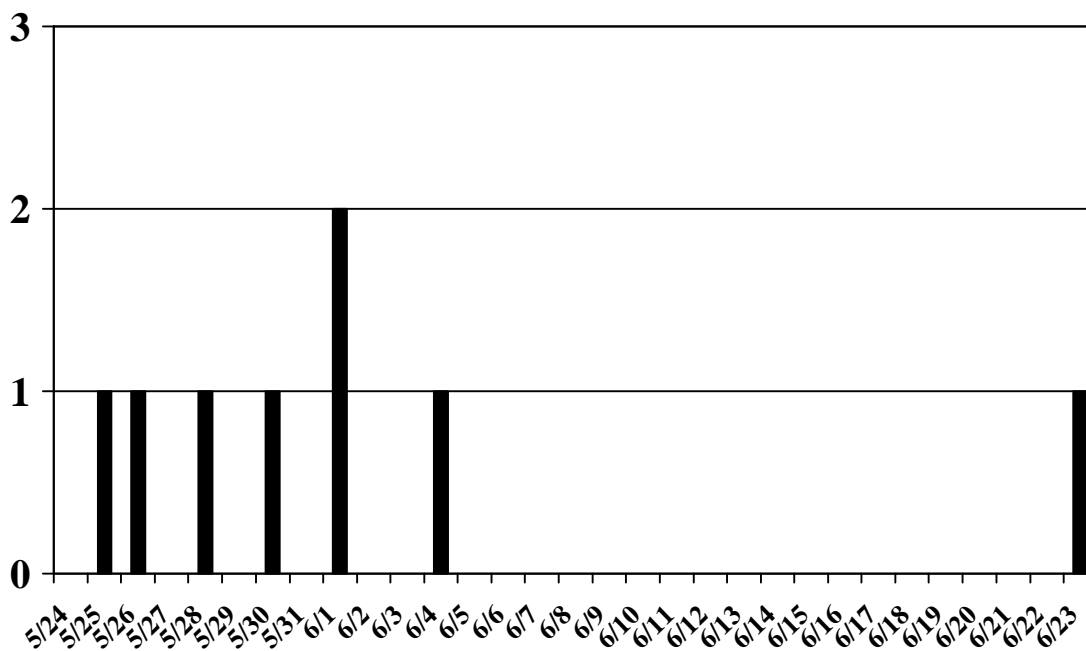
(+) = *E. coli* O157:H7 identified in sample

Figure 1  
***E. Coli* O157:H7 Cases by Onset Date**  
**1998 Cluster A1: Massachusetts/Connecticut**



N=20\* \* Onset dates known for 15 of 20 cases.

Figure 2  
***E. Coli* O157:H7 Cases by Onset Date**  
**1998 Cluster A2: Massachusetts/Company b and Company Company C**



N=9\* \* Onset dates known for 8 of 9 cases.

## PFGE (Pulsed Field Gel Electrophoresis)

*Deborah Shea and Joseph Peppe  
State Laboratory Institute*

The State Laboratory Institute (SLI) was represented by Ralph Timperi, SLI Director, at a White House Ceremony in May 1998 at which Vice President Al Gore announced the launch of PulseNet, the CDC computer network that tracks food-borne illness. Massachusetts was one of four state public health laboratories initially designated as a regional

**Molecular Laboratory among first to join national network for subtyping of *E. coli* O157:H7.**

testing site for Pulsed Field Gel Electrophoresis (PFGE). The regional laboratories perform PFGE according to a standard protocol and incorporate universal standards to assure comparable DNA patterns from PFGE analyses (*JAMA*, 277:17, 1998, 1337-40).

SLI receives isolates of *Escherichia coli* O157: H7 and other

bacterial organisms causing food-borne diseases. Hospital and independent clinical laboratories are a key partner in this disease surveillance system and regularly send isolates to SLI. These isolates are confirmed by biochemical tests, serotyped and then tested by PFGE. Laboratory-based surveillance using molecular subtyping of pathogens monitors trends in causes of illness, and rapidly identifies clusters of disease. When an outbreak is suspected, a 24-hour PFGE protocol is used to evaluate suspect specimens for genetic relatedness. When isolates are found with the "same" DNA pattern by PFGE analysis (interpreted as "indistinguishable" DNA patterns), epidemiologists can follow-up to confirm linkage between cases using additional information such as food histories. The specificity and shortened analytical time of the PFGE proce-

dures permits early detection and action to control a disease outbreak and prevent further food-borne disease.

Local and multi-state outbreaks have been identified within a few days of the start of a widespread event using the PulseNet system. The national database allows testing centers to compare their DNA patterns in real time with patterns from other centers. If similar patterns are found in the database, epidemiologic data can be retrieved and contact made with epidemiologists from other affected states. Using PulseNet, multi-state outbreaks have been identified among contiguous states, e.g., suspected contaminated hamburger linked to cases in Massachusetts, New Hampshire, and Connecticut (see report on page 5) and among distant states, e.g., suspected contaminated parsley linked to cases in Massachusetts, Minnesota, and Washington.

At this time, *E. coli* O157:H7 and *Salmonella* typhimurium protocols have been validated and standardized among the regional laboratories. *Salmonella* typhimurium will be the next organism added to the PFGE national database. Although their protocols are not fully validated, other organisms have been analyzed by PFGE and have shown good comparability among the regional laboratories. The regional laboratories use the same equipment, reagents and protocols, which aid comparison of test results. SLI has analyzed isolates of *Salmonella* sp., *Shigella* sp., *Listeria monocytogenes* and *Neisseria meningitidis* and identified apparently related cases based on genetic similarity of the organisms and epidemiologic relationship (e.g., time, place and common source).

Pulsed-field gel electrophoresis now is in widespread use as a tool in molecular epidemiology. Interpretation of DNA patterns following PFGE is becoming more refined as the central database provides more information on the natural

prevalence and diversity of PFGE patterns.

PFGE is based on electrophoretic analysis of an enzyme digest of a bacterial suspension in an agarose gel utilizing a multi-directional electrical field. Bacteria are immobilized in agarose plugs, lysed and treated with a restriction endonuclease (RE) to cut the bacterial DNA into many fragments of assorted sizes. The RE cuts each DNA strand many times at recognition sites, which typically are 5-6 base pairs long. Sometimes an isolate is analyzed using a second RE to confirm findings in the first analysis.

High resolution is obtained in PFGE due to the application of a consistently increasing switch time in the electrical field (pulsed field) being applied to the gel. Bacterial fragments move through the gel at a speed proportional to their size with the smaller fragments moving more rapidly. Following electrophoresis, gels are stained to visualize the “bands” of similar sized fragments, and the patterns are photographed. The photograph is scanned into a computer and digitized to permit software-assisted analysis and comparison of patterns.

Each PFGE run on a single gel sheet can contain up to 15 “lanes” with 12 individual samples and three standards.

Although interpretation criteria vary depending on the organism and the epidemiologic situation, common criteria have been established as a guideline for interpreting test results.

One set of criteria for interpretation has been used widely in PFGE analysis (Tenover et al, *J. Clin. Micro.*, 33, 2233, 1995). These criteria are shown in Table 1.

Outbreak strains are isolates of the same species that are epidemiologically and genetically related. Such isolates are presumed to be clonally related when they exhibit common phenotypes and genotypes and are temporally related.

Endemic strains are isolates that are found frequently from infected patients in a health care setting or community and are indistinguishable or closely related by typing methods, but have no demonstrable epidemiologic link. Such isolates are presumed to be clonally related, but their common origin may be more temporally distant compared to outbreak strains.

Knowledge of PFGE gel patterns is growing rapidly as data and information from thousands of test results run under standardized protocols are

**Table 1. Criteria for Interpreting PFGE Patterns**

Category	Number of genetic differences	Typical number of fragment differences	Epidemiologic relatedness of the isolate in relation to the outbreak
Indistinguishable	0	0	Part of outbreak
Closely related	1	2-3	Probable
Possibly related	2	4-6	Possible
Different	33	37	Not part of outbreak

compiled through the regional public health laboratory system. This powerful laboratory method is aiding disease control activities and will assist the assurance of a safe food supply. For additional information about the PFGE testing program at SLI, contact [deborah.shea@state.ma.us](mailto:deborah.shea@state.ma.us).

**Reprinted courtesy of the State Laboratory Institute Newsletter ([www.state.ma.us/dph/sli.htm](http://www.state.ma.us/dph/sli.htm)). The complete article was published in the January 1999 issue. ❖**

# Mass Treatment of Humans Who Drank Unpasteurized Milk from Rabid Cows Massachusetts, 1996-1998

*Morbidity and Mortality Weekly Report/ Centers for Disease Control and Prevention*

*March 26, 1999/48(11);228-229*

*Available at: <http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00056759.htm>*

*Accessed: May 11, 1999*

Rabies is a viral zoonosis that is usually transmitted by the bite of an infected mammal. However, in Massachusetts, two incidents have been reported since 1996 of potential mass exposures to rabies through drinking unpasteurized milk. This report presents the investigations of these two incidents.

## Incident 1

On November 12, 1998, the Virology Laboratory of the Massachusetts Department of Public Health (VLMDPH) di-

agnosed rabies in a 6-year-old Holstein dairy cow from a farm in Worcester County. Further analysis of the cow's brain tissue with monoclonal antibodies revealed the cow was infected with a variant of the rabies virus associated with raccoons in the eastern United States.

The cow had loss of appetite beginning November 4 and hypersalivation beginning November 6. An intestinal obstruction was suspected initially as the cause of illness. However, the cow became ataxic and aggressive and died on November 8.

The cow had been milked 12 times during the week before death. Milk from the cow had been pooled with milk collected from other cows, and an unpasteurized portion was distributed for human consumption. Public health investigations identified 66 persons who drank unpasteurized milk collected from this dairy during October 23-November 8. All 66 re-



ceived rabies postexposure prophylaxis (PEP). In addition, five persons received PEP because of exposure to the cow's saliva during the 15 days preceding her death. Neither milk nor mammary tissue from the rabid cow was available for examination for the presence of rabies virus.

## Incident 2

On November 12, 1996, the VLMDPH diagnosed rabies in a 14-year-old Jersey dairy cow from a different farm in Worcester County. Analysis with monoclonal antibodies revealed the cow was infected with a variant of the rabies virus associated with raccoons in the eastern United States.

The cow developed tenesmus and depression on November 6 and was euthanized on November 10. The cow had been milked during October 26-November 2. An investigation identified 14 persons who drank unpasteurized milk collected from this cow during this period. All 14 persons received rabies PEP. In addition, four persons received PEP because of exposure to the rabid cow's saliva during the 15 days preceding her death.



Reported by: M McGuill, DVM, B Matyas, MD, B Werner, PhD, A DeMaria, Jr, MD, State Epidemiologist, Massachusetts Dept of Public Health. Viral and Rickettsial Zoonoses Br, Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases; and an EIS Officer, CDC.

## Editorial Note

Editorial Note: Management of mass human exposures to rabid animals requires public health officials to balance knowledge of rabies epidemiology, risk for transmission, and pathogenesis with the perceived risk for death among exposed persons. Because of the nearly 100% case-fatality ratio of human rabies and the virtually complete effectiveness of PEP, many mass exposure incidents prompt administration of rabies immune globulin and vaccine, even if the circumstances do not meet the criteria for exposure (1-3).

During 1990-1996, CDC received reports of 22 incidents of mass human exposures to rabid or presumed-rabid animals in the United States, resulting in 1908 persons receiving PEP (median: 33 persons per incident) (4). In Massachusetts during 1991-1995, the median cost for PEP was \$2376 per person, including physician and facility charges (5). Prolific administration of PEP in response to these incidents strains the availability of rabies biologics, especially human rabies immune globulin, which has a short shelf-life and tightly controlled distribution by the manufacturers.

An average of 150 rabid cattle have been reported to CDC in the United States each year since 1990 (6). In addition to concerns about rabies transmission from animals to humans through bites, rabid livestock raise the potential for foodborne transmission. The National Association of State Public Health Veterinarians recommends against consuming tissues and milk from rabid animals (2). However, because rabies virus is inactivated by temperatures below those used for cooking and pasteurization, eating cooked meat or drinking pasteurized milk from a rabid animal is not an indication for PEP.

Rabies virus can be transmitted by direct contact with infected material, such as saliva from an animal infected with rabies, and mucous membranes, including the oral and gastric mucosae (7). In addition to saliva and neural tissue, rabies virus also has been de-

tected in the kidney, prostate, pancreas, and other tissues and body fluids (8). However, saliva and neural tissue are the primary proven vehicles for rabies virus in naturally occurring cases. Anecdotal reports exist of rabies transmission by ingestion of milk from rabid animals (e.g., from a rabid sheep to a nursing lamb) (7). In these reports, the more conventional routes (e.g., bite or mucous membrane exposure) could not be completely excluded.

Transmission of rabies virus in unpasteurized milk is theoretically possible. The risk could be defined better if samples of milk and mammary tissue were collected from rabid livestock and assayed for the presence, viability, and infectivity of rabies virus. Regardless of the amount of viable rabies virus that may be shed in cows' milk, the theoretical risk for transmission of rabies from this route can be eliminated if all dairy products are pasteurized before consumption.

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As of March 1999, all applications for permits issued by the Food Protection Program are now available "on-line." In cooperation with the Internet Web staff at the MDPH, copies of the applications and support materials are now downloadable. The site also a series of fact sheets to assist with the application and inspection. The Downloadable License/Permit Applications include:

### Food Processing

- Initial Licensure for Food Processing and/or Distribution at Wholesale
- Transport Bakery Products into the Commonwealth for the Purpose of Sale
- Slaughtering and Processing Meat and Poultry

### Food Cold Storage

- Frozen Desserts and Ice Cream Mix Transported into the Commonwealth
- Manufacture and Sale of Stuffed Toys
- Manufacture and Sale of Upholstered Furniture and Bedding
- Sterilization/Sanitation of Bedding, Upholstered Furniture, and Filling Materials
- Bottled Water or Carbonated Nonalcoholic Beverages

- In-state
  - Out-of-state

### Vending Machines

- Food and/or Beverage
  - Water

### Methyl and Wood Alcohol

To access and download any of these application forms as well as support information, the Internet address is <http://www.state.ma.us/dph/fpp/fpplic.htm>. ❖

# Outbreaks of *Shigella sonnei* Infection Associated with Eating Fresh Parsley

## United States and Canada, July-August 1998

*Morbidity and Mortality Weekly Report/ Centers for Disease Control and Prevention*

April 16, 1999/48(14);285-9

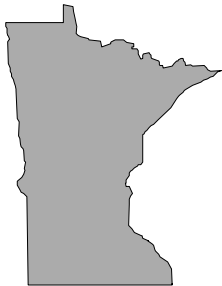
Available at: <http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/00056895.htm>

Accessed: April 20, 1999

In August 1998, the Minnesota Department of Health reported to CDC two restaurant-associated outbreaks of *Shigella sonnei* infections. Isolates from both outbreaks had two closely related pulsed-field gel electrophoresis (PFGE) patterns that differed only by a single band. Epidemiologic investigations implicated chopped, uncooked, curly parsley as the common vehicle for these outbreaks. Through inquiries to health departments and public health laboratories, six similar outbreaks were identified during July-August (in California {two}, Massachusetts, and Florida in the United States and in Ontario and Alberta in Canada). Isolates from five of these outbreaks had the same PFGE pattern identified in the two outbreaks in Minnesota. This report describes the epidemiologic, traceback, environmental, and laboratory investigations, which implicated parsley imported from a farm in Mexico as the source of these outbreaks.

### United States

**Minnesota** On August 17, the Minnesota Department of Health received reports of shigellosis in two persons who ate at the same restaurant during July 24-August 17 (Figure.1). *S. sonnei* subsequently was isolated from stool samples of 43 ill restaurant patrons; an additional 167 persons had probable shigellosis (diarrhea



{three or more loose stools during a 24-hour period} lasting greater than or equal to 3 days or accompanied by fever). Eight (18%) of 44 restaurant employees had a similar illness; five had laboratory-confirmed *S. sonnei* infec-

tion. In a case-control study of 172 ill and 95 well restaurant patrons, five items were associated with illness: water (odds ratio {OR}=1.9; 95% confidence interval {CI}=1.0-3.8), ice (OR=3.7; 95% CI=1.6-8.6), potatoes (OR=2.6; 95% CI=1.5-4.6), uncooked parsley (OR=4.3; 95% CI=2.4-8.0), and raw tomato (OR=1.9; 95% CI=1.0-3.9). In a multivariate analysis, only uncooked parsley (OR=4.3; pless than 0.01) and ice (OR=6.9; pless than 0.01) remained significantly associated with illness.

### California

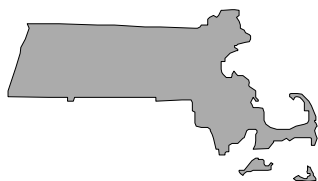


On August 5, the Los Angeles County Department of Health Services was notified of two persons with shigellosis who ate at the same restaurant on July 31. Stool samples from six ill restaurant patrons yielded *S. sonnei*; an additional three had probable shigellosis (diarrhea {three or more loose stools during a 24-hour period},

or any loose stools accompanied by fever). All 27 foodhandlers denied illness and had stool samples that were negative for *S. sonnei*. In an unmatched comparison with 10 well dining companions, ill patrons were significantly more likely to have eaten foods sprinkled with chopped, uncooked parsley (OR=32.0; 95% CI=1.8-1381.4).

### Massachusetts

On August 11, the Mas-



sachusetts Department of Health was notified of six persons who reported illness after eating at a restaurant lunch party

on July 30. Stool samples from three persons yielded *S. sonnei*; an additional three had probable shigellosis (diarrhea within 4 days of the July 30 meal). Chopped, uncooked parsley was served on chicken sandwiches and in cole slaw served at the lunch. In a cohort study of 23 lunch attendees, illness was significantly associated with eating chicken sandwiches (relative risk {RR}=10.0; 95% CI=2.7-37.2) or eating uncooked parsley with any item (RR=10.0; 95% CI=1.4-70.2). All restaurant employees except one submitted a stool sample for culture; all were negative for *S. sonnei*.

### Canada

On August 10, the Ontario Ministry of Health was notified of a family of three persons with



*S. sonnei* infection who attended a food fair during July 31-August 3. Laboratory-based surveillance identified 32 additional persons with *S. sonnei* infection

who had eaten at a specific kiosk at the fair or at the restaurant that had supplied the kiosk. Of the 35 persons, 20 were questioned about food history; all reported eating a smoked salmon and pasta dish made with fresh chopped parsley. Stool samples from six (38%) of 16 foodhandlers, including the four who handled the parsley, were negative for *S. sonnei*. One child who had eaten at the kiosk was the index patient at a day care center, from which five secondary cases of shigellosis were reported.

### Other Investigations

In addition to these four outbreaks, four additional restaurant-associated outbreaks of *S. sonnei* were identified, involving an additional 218 persons with culture-confirmed or proba-

ble shigellosis. Of the 111 persons interviewed, 106 (96%) reported eating chopped, uncooked, curly parsley. Isolates from three of these outbreaks (in Minnesota and California in the United States and in Alberta in Canada) matched the outbreak PFGE pattern. In the fourth outbreak (in Florida), one culture-confirmed case was identified; the isolate was not available for PFGE testing.

### Traceback and Environmental Investigations

To determine the source(s) of parsley for the seven outbreaks linked by PFGE, state and provincial health departments, CDC, the Food and Drug Administration (FDA), and the Canadian Food Inspection Agency conducted traceback investigations. Farm A in Baja California, Mexico, was a possible source of parsley served in six of the seven outbreaks; four farms in California were possible sources of parsley in two to four of the seven outbreaks.

Field investigations of farm A by FDA and CDC found that the municipal water that supplied the packing shed was unchlorinated and vulnerable to contamination. This water was used for chilling the parsley in a hydrocooler immediately after harvest and for making ice with which the parsley was packaged for transport. Because the water in the hydrocooler was recirculated, bacterial contaminants in the water supply or on the parsley could have survived in the absence of chlorine and contaminated many boxes of parsley. Farm workers and village residents served by this water system reported drinking bottled water or water from other sources. Workers had limited hygiene education and limited sanitary facilities available on the farm at the time of the outbreak.

Foodhandlers at six (75%) of the eight implicated restaurants reported washing parsley before chopping it. Usually parsley was chopped in the morning and left at room temperature, sometimes until the end of the day, before it was served to customers.

### **Laboratory Investigations**

The Minnesota Department of Health laboratory, which has tested isolates of *S. sonnei* by PFGE routinely since 1995, identified a previously unrecognized PFGE pattern of *S. sonnei* and a closely related pattern that differed by a single band associated with the two outbreaks in Minnesota. The pattern was distributed to other laboratories through PulseNet, the national molecular subtyping network for foodborne disease. In Minnesota and at CDC, strains from all seven outbreaks for which isolates were available for PFGE testing had the outbreak PFGE pattern. Isolates from the seven outbreaks were resistant to ampicillin, trimethoprim-sulfamethoxazole, tetracycline, sulfisoxazole, and streptomycin.

Investigators at the University of Georgia Center for Food Safety and Quality Enhancement conducted studies to determine the effects of temperature and handling on the growth and survival of *S. sonnei* on parsley. Colony-forming units of *S. sonnei* per gram (cfu/g) decreased by approximately 1 log per week on parsley, whether chopped or whole, under refrigeration (39°F {4°C}). In contrast, *S. sonnei* counts increased on parsley kept at room temperature (70°F {21°C}). On whole parsley, the increase was limited to 1 log cfu/g during the first 1-2 days, but on chopped parsley a 3 log cfu/g increase was observed within 24 hours.

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### **Editorial Note**

Editorial Note: *S. sonnei* is a common cause of gastroenteritis, accounting for 10,262 (73%) of the 14,071 laboratory-confirmed *Shigella* infections reported to CDC in 1996 (1). Humans and other primates are the only reservoirs for *S. sonnei*, and transmission occurs through the fecal-oral route. As few as 10-100 organisms can cause infection, enabling person-to-person transmission where hygienic conditions are compromised. In the United States, *S. sonnei* primarily infects young children and is a common cause of diarrheal outbreaks in child care centers (2). Although reported infrequently, foodborne outbreaks of shigellosis have been associated with raw produce, including green onions (3), iceberg lettuce (4-7), and uncooked baby maize (8).

Before the outbreak described in this report, PFGE was not used routinely by most state public health laboratories to subtype isolates of *S. sonnei*, making it difficult to detect clusters or outbreaks. This investigation demonstrated how the routine use of PFGE and PulseNet can link clusters of *S. sonnei* infections in widely dispersed geographic areas. This same technology is now used widely for comparing isolates of *Escherichia coli* O157:H7. CDC, in consultation with the Minnesota Department of Health, is developing a standard protocol for PFGE subtyping of *S. sonnei* isolates by PulseNet laboratories.

In the outbreak described in this report, isolates were resistant to many antimicrobial

agents, including ampicillin and trimethoprim-sulfamethoxazole, which are commonly used to treat shigellosis. This highly resistant pattern is seen more frequently in countries other than the United States. During 1985-1995, antimicrobial resistance among *Shigella* increased substantially in the United States (9): resistance to ampicillin increased from 32% to 67%, resistance to trimethoprim-sulfamethoxazole increased from 7% to 35%, and resistance to both agents increased from 6% to 19%. A history of international travel was the strongest risk factor for *Shigella* infection resistant to trimethoprim-sulfamethoxazole (9).

The findings in this report indicate that several changes in food storage and food preparation procedures are needed. In restaurants, food-handling practices such as pooling large batches of parsley for chopping and holding chopped parsley at room temperature increase the risk that sporadic low-level bacterial contamination will lead to outbreaks of gastrointestinal illness. When fresh produce is chopped, the release of nutrients may provide a favorable medium for bacterial growth. The risk for outbreaks can be reduced by storing chopped parsley for shorter times, keeping it refrigerated, and chopping smaller batches (10). Changes in parsley production on the farm (e.g., the use of adequately chlorinated water for chilling and icing parsley, education of farm workers on proper hygiene, and possibly the use of post-harvest control measures such as irradiation) may be necessary to ensure that produce is not contaminated with pathogens.

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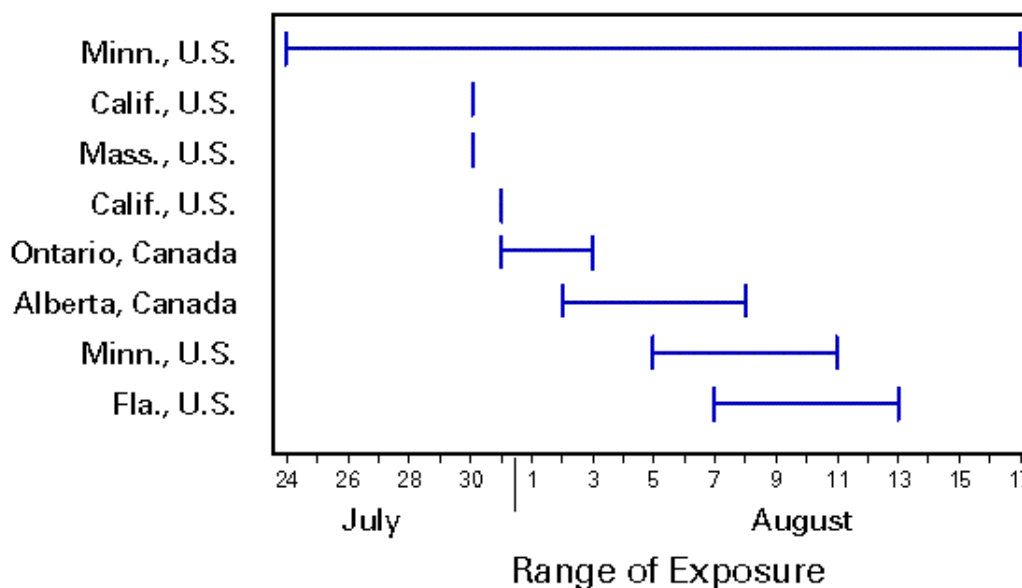
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and growth of *Shigella sonnei* on parsley. Presented at the sixth annual meeting of the Center for Food Safety and Quality Enhancement. Atlanta, Georgia, March 1999.

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**FIGURE 1. Range of dates of exposure for persons infected with *Shigella sonnei* in outbreaks associated with eating fresh parsley — United States\* and Canada, July–August, 1998**



\*Minnesota and California each reported two outbreaks.

**Ciguatera Fish Poisoning**  
from  
U.S. Food & Drug Administration  
Center for Food Safety & Applied Nutrition  
**Foodborne Pathogenic Microorganisms  
and Natural Toxins Handbook**  
<http://vm.cfsan.fda.gov/~mow/chap36.html>  
accessed: May 7, 1999

**1. Name of Toxin: Ciguatera**

**2. Name of Disease: Ciguatera Fish Poisoning**

**Ciguatera** is a form of human poisoning caused by the consumption of subtropical and tropical marine finfish which have accumulated naturally occurring toxins through their diet. The toxins are known to originate from several dinoflagellate (algae) species that are common to **ciguatera** endemic regions in the lower latitudes.

**3. Nature of Disease:** Manifestations of **ciguatera** in humans usually involves a combination of gastrointestinal, neurological, and cardiovascular disorders. Symptoms defined within these general categories vary with the geographic origin of toxic fish.

**4. Normal Course of Disease:** Initial signs of poisoning occur within six hours after consumption of toxic fish and include perioral numbness and tingling (paresthesia), which may spread to the extremities, nausea, vomiting, and diarrhea. Neurological signs include intensified paresthesia, arthralgia, myalgia, headache, temperature sensory reversal and acute sensitivity to temperature extremes, vertigo, and muscular weakness to the point of prostration. Cardiovascular signs include arrhythmia, bradycardia or tachycardia, and reduced blood pressure. **Ciguatera** poisoning is usually self-limiting, and signs of poisoning often subside within several days from onset. However, in severe cases the neurological symptoms are known to persist from weeks to months. In a few isolated cases neurological symptoms have persisted for several years, and in other cases recovered patients have experienced recurrence of neurological symptoms months to years after recovery. Such relapses are most often associated with changes in dietary habits or with consumption of alcohol. There is a low incidence of death resulting from respiratory and cardiovascular failure.

**5. Diagnosis of Human Illness:** Clinical testing procedures are not presently available for the diagnosis of **ciguatera** in humans. Diagnosis is based entirely on symptomology and recent dietary history. An enzyme immunoassay (EIA) designed to detect toxic fish in field situations is under evaluation by the Association of Official Analytical Chemists (AOAC) and may provide some measure of protection to the public in the future.

**6. Associated Foods:** Marine finfish most commonly implicated in **ciguatera** fish poisoning include the groupers, barracudas, snappers, jacks, mackerel, and triggerfish. Many other species of warm-water fishes harbor **ciguatera** toxins. The occurrence of toxic fish is sporadic, and not all fish of a given species or from a given locality will be toxic.

**7. Relative Frequency of Disease:** The relative frequency of **ciguatera** fish poisoning in the United

States is not known. The disease has only recently become known to the general medical community, and there is a concern that incidence is largely under-reported because of the generally non-fatal nature and short duration of the disease.

**8. Target Population:** All humans are believed to be susceptible to **ciguatera** toxins. Populations in tropical/subtropical regions are most likely to be affected because of the frequency of exposure to toxic fishes. However, the increasing per capita consumption of fishery products coupled with an increase in interregional transportation of seafood products has expanded the geographic range of human poisonings.

**9. Analysis of Foods:** The **ciguatera** toxins can be recovered from toxic fish through tedious extraction and purification procedures. The mouse bioassay is a generally accepted method of establishing toxicity of suspect fish. A much simplified EIA method intended to supplant the mouse bioassay for identifying **ciguatera** toxins is under evaluation.

**10. Selected Outbreaks:** Isolated cases of **ciguatera** fish poisoning have occurred along the eastern coast of the United States from south Florida to Vermont. Hawaii, the U.S. Virgin Islands, and Puerto Rico experience sporadic cases with some regularity. A major outbreak of **ciguatera** occurred in Puerto Rico between April and June 1981 in which 49 persons were afflicted and two fatalities occurred. This outbreak prompted government officials of the Commonwealth of Puerto Rico to ban the sale of barracuda, amberjack, and blackjack.

In February-March of 1987 a large common-source outbreak of **ciguatera** occurred among Canadian vacationers returning from a Caribbean resort. Of 147 tourists, 61 ate a fish casserole shortly before departure, resulting in 57 identified cases of **ciguatera**.

In May of 1988 several hundred pounds of fish (primarily hogfish) from the Dry Tortuga Bank were responsible for over 100 human poisonings in Palm Beach County, Florida. The fish were sold to a seafood distributor after the fishermen (sport spearfishermen) themselves were first afflicted but dismissed their illness as seasickness and hangover. The poisonings resulted in a statewide warning against eating hogfish, grouper, red snapper, amberjack, and barracuda caught at the Dry Tortuga Bank.❖

**Retail Food Protection Program Q and A's**  
*Priscilla Neves, R.S.; Ellen Gould, M.P.H.;*  
*and Tracy A. Miller, J.D., Office of the General Counsel*

**Question: Can leftover unopened cartons of milk in school lunch programs be donated to food rescue programs?**

**Answer:** Schools are required to provide milk to children as part of the United States Department of Agriculture's requirements for school lunch programs. Since the children may choose not to drink their milk, many unopened cartons of milk are eventually discarded. The donation of unopened containers of milk to food-rescue programs is one solution for preventing waste while helping those in need. Food-rescue is the sensible act of collecting surplus, unserved food that would otherwise be tossed in dumpsters. This food is then safely distributed to social-service agencies that feed people in need. Since milk is a potentially hazardous food, leftover milk intended to be donated should be properly handled to prevent microbiological hazards. Leftover cartons of milk should be closely examined to verify the integrity of the seal and the cleanliness of the carton itself.

Both federal guidelines (U.S Food and Drug Administration (FDA) 1997 Food Code, 3-306.14 *Returned Food Reservice or Sale* and state regulation (105 CMR 590.000 Minimum Sanitation Standards for Food Establishments-Chapter X, section 590.010 *Returned Food, Reservice or Sale*) prohibit the re-sale of milk in unopened containers because milk is a potentially hazardous food. Food can serve as a means of person-to-person transmission of disease agents such as the hepatitis A virus. Although unopened packages of refrigerated, potentially hazardous foods are at less risk of hand contamination from a previous handler, there is still potential for the growth of disease causing organisms and the production of toxins if not maintained at safe temperatures.

Because milk is pasteurized, pathogens are

destroyed but spoilage organisms remain.

While the milk may be safe to drink for up to four or more hours at room temperature, the remaining spoilage organisms could cause the milk to spoil rapidly if temperature abused. The quality of leftover cartons of milk may be minimally impacted if steps are taken to minimize the time left at room temperature during service to the children. The Division recommends the following procedures for food establishments for the handling of cartons of milk which may be donated to food rescue programs.

- Check incoming milk deliveries to ensure that temperatures upon receiving are at or below 45°F.
- Hold milk at 45°F or below during storage and service. (At or below 41°F is strongly recommended). Colder storage temperatures will result in longer shelf-life of the product.
- Carefully inspect leftover milk cartons to ensure that the container is sealed and is clean.
- Do not leave leftover cartons of milk out of refrigeration for more than 30 minutes to one hour maximum from the time of service.
- Leftover cartons of milk to be donated should be set aside in the refrigerator and marked for intended use. The milk should be picked up or delivered as soon as possible (within 24-48 hours).

Most milk cartons sold to schools are well within their expiration date. Milk which has gone beyond the expiration date on the carton may not be sold in schools and, under these circumstances, should not be donated. Food banks and soup kitchens accepting donated milk should be equally cautious in maintaining proper temperature of the milk during trans-

portation, storage and service.

#### ***Additional Resources***

United States Department of Agriculture. *USDA Food Recovery and Gleaning Initiative, May 1998*

Food Chain (The National Food-Rescue Network)  
800-845-3008 (www.foodchain.org)

Second Harvest  
116 S. Michigan Avenue, Suite 4  
Chicago, Illinois 60603-6001  
Telephone: 312-263-2303  
Fax: 312- 263-5626

American Culinary Federation  
Chef and Child Foundation  
10 San Bartola Drive  
St. Augustine, FL 32086  
904-824-4468 ext.104

#### **Question: Can sanitizers be used on produce in retail food establishments?**

**Answer:** A number of foodborne illness outbreaks have been the result of contaminated fruits and vegetables.<sup>1</sup> Hazards associated with ready-to-eat produce need to be controlled in the growing and handling practices of produce from farm to table. Chlorine added to water at 50–200 ppm total chlorine, at a pH of 6.0–7.5, with a 1-2 minute contact time has been a common practice in the produce processing industry.<sup>2</sup> The use of chlorine and other antimicrobial agents on produce is now extending into the retail food industry in an attempt to further reduce microbial contamination. To prevent or reduce the risk of chemical contamination, chlorine and other produce sanitizers must be approved for use on food and must be properly used.

The washing of produce in retail food establishments is addressed in Massachusetts regulation 105 CMR 590.000-Minimum Sanitation Standards for Food Establishments-Chapter X. Section 590.007(E) *Washing Fruits and Veg-*

*etables* requires all raw fruits and be thoroughly washed in water to remove soil and other contaminants before being cut, combined with other ingredients, cooked, served or offered for human consumption in ready-to-eat form. Whole, raw fruits and vegetables intended for washing by the consumer before consumption does not need to be washed before being sold. There is no requirement that antimicrobials be used in the wash process. If a chemical sanitizer or any other chemical product is used to wash produce it must be used in accordance with 21 CFR 173.315. The levels of chemicals used must not exceed the minimum required to accomplish the intended effect. To assure safe use of the additive, the label on the additive container must include the name of the additive or a statement of its composition as well as directions for use. The use of chemical antimicrobial agents must also be followed by a potable water rinse.

A number of recommendations are available in the “Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables.”<sup>2</sup> Although this is a guideline for growers, packers and shippers, it contains useful guidance information that can benefit persons responsible for ensuring safe produce in the retail food industry.

- Operators should carefully read antimicrobial chemical labels, regulations, and other relevant information. Operators should follow manufacturers’ directions for correct mixing of antimicrobial chemicals to obtain effective concentrations and to minimize safety hazards.
- Operators should not exceed recommended levels and must not exceed allowable levels of antimicrobial chemicals in wash water. Excessive concentrations of antimicrobial chemicals (such as chlorine) can damage equipment, reduce produce quality, be harmful to worker health, and may pose a hazard to consumers.
- Antimicrobial chemical levels should be routinely monitored and recorded to ensure

that they are maintained at appropriate concentrations. Other parameters (such as pH, temperature, and oxidation reduction potential [ORP]) that indicate levels of active agents or that affect the effectiveness of the antimicrobial used, should also be monitored and recorded. Operators should establish standard operating procedures (SOPs) for monitoring, recording, and maintaining antimicrobial chemical levels.

- As organic materials and microbial load increases in wash water, the efficacy of antimicrobial chemicals decreases, rendering them inactive against microorganisms.
- Operators should contact chemical companies that sell antimicrobial chemicals for additional technical assistance.

In addition, employees should be thoroughly trained in the use of antimicrobial chemicals and routinely monitored to ensure safe application.

<sup>1</sup> Beuchat, Larry R., 1995. Pathogenic Microorganisms Associated with Fresh Produce. J. of Food Protection. 59:204-216.

<sup>2</sup> U.S. Food and Drug Administration. 1998. Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables.

#### ***Additional Resources***

International Fresh-cut Produce Association (IFPA)  
1600 Duke Street, Suite 440  
Alexandria, Virginia 22314  
Telephone: 703-299-6282  
Fax: 703-299-6288  
www.fresh-cut.org

NSF International  
PO Box 130140  
Ann Arbor, MI 48113-0140  
Telephone: 734-769-8010  
Toll Free: 800-NSF-MARK  
Fax: 734-769-0109  
E-mail: info@nsf.org

**Question: What is the Massachusetts Department of Public Health's policy for catered meals transported to off-site feeding**

#### **locations ?**

**Answer:** A growing trend in the food industry involves food service establishments<sup>1</sup>, licensed under 105 CMR 590.00, providing single meals to privately and publicly sponsored programs (hereinafter "programs") usually intended for children and seniors<sup>2</sup>. Until recently, for the most part, such programs prepared the food on site. The Department is now seeing an increased number of food establishments that prepare the food or meals for the programs at their establishments and then deliver the food or contract for its delivery to the site where it is served by program staff. The meals may be individually packaged for single service or provided in bulk for dispensing on site at a specific meal.

#### ***Criteria for classification as a caterer***

In order to qualify as a caterer for the purposes of this policy and to be exempt from licensure as a wholesale food processor under M.G.L. c. 94, § 305C, the food service establishment must demonstrate that:

- food is pre-ordered for a single meal;
- meals are prepared and delivered for a specific meal, either in individual portions or in bulk portions intended for individual service at a specific meal;
- meals are fully cooked or prepared by the caterer;
- meals are stored and delivered under required temperatures; and
- such other factors as the Department deems relevant to the classification.

The Massachusetts Department of Public Health, Division of Food and Drugs, determines, that food service establishments are caterers and shall be exempt from licensure as a wholesale food processor if they: (1) prepare food intended for individual service and delivered to a feeding site as described above, and (2) meet the above-referenced criteria. Caterers are licensed and inspected by local boards of health as one category of food service establishments, and as such are subject to the provisions of 105 CMR 590.000, Minimum Sanitation Standards

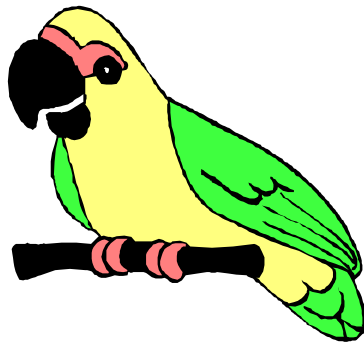
for Food Establishments. Nothing in this policy is intended to restrict the definition of caterer in 105 CMR 590.000.

<sup>1</sup> For the purposes of this policy, food service establishments includes caterers, restaurants, and institutional kitchens (nursing homes, hospitals, and schools). This includes, not only more traditional catering operations as well as institutional kitchens, but also restaurants that are providing fast food or pizza as single meals for programs, not unlike take-out. They shall collectively be referred to as caterers, if they meet the criteria defined herein.

<sup>2</sup> Programs include, but are not limited to, day care centers, head start programs, senior centers, and “meals on wheels.”

**Question: Are birds permitted in a food establishment?**

**Answer:** Section .027(F) *Animals* of the Massachusetts Regulation 105 CMR 590.000—Minimum Sanitation Standards for Food Establishments—Article X, prohibits animals such as birds inside of a food establishment. Section 6-501.115 *Prohibiting Animals* of the United States Food and Drug Administration (FDA) 1999 Model Food Code also prohibits birds in a food establishment. Live animals are permitted in specific circumstances including support animals, fish, shellfish and crustacea and patrol dogs.



The public health rationale for such a requirement is that animals, including birds, may carry disease-causing organisms and can transmit these organisms to humans through direct and/or indirect contamination of food and food contact surfaces. Animals can at anytime become infected with these disease-causing organisms.

The Department would not object to a vari-

ance being granted by a local board of health for a bird being allowed in a food establishment provided the following practices are implemented and monitored:

1. The area in which a bird is kept is physically separated from dining rooms, bars, and food preparation and handling areas.
2. The bird's cage is cleaned and maintained away from the kitchen and employee bathrooms.
3. The bird and its' cage is handled by a designated person who does not work with unpackaged food and drink, food equipment and utensils, or food contact surfaces.
4. No food or single service articles are stored in the area in which the bird and cage are stored.
5. The bird is not permitted in the dining, bar and food storage or preparation areas.

Local boards of health are ultimately responsible for approving or denying any such variance and may have more stringent ordinances or regulations than are provided for in 105 CMR 590.000. ❖



## Food Code: Train the Trainer Course

The Massachusetts Division of Food and Drugs and the federal Food and Drug Administration (FDA) State Training Branch will present a course entitled, "Food Code: Train the Trainer" September 13-17, 1999, in Worcester, MA.

The first day of the course (Monday, Sept. 13) will be concerned with effective training techniques, and will be open to state and federal regulators ONLY. These trainers will be expected to return to their respective organizations and conduct Food Code courses for their fellow employees, industry and other interested parties.

The remaining portion of the week will cover advanced training on the FDA '99 Model Food Code. This part of the course is open to individuals from local health authorities, industry and other allied parties.

Announcements and registration forms for both parts of the Food Code course will be available in the summer from the Division of Food and Drugs. Any questions should be directed to Beth Altman, at the Division, 617-983-6769. ♦

## Questions Keep Sprouting About Sprouts

*Paula Kurtzweil, FDA Public Affairs staff  
FDA Consumer Magazine (January-February 1999)*

Sprouts--those crunchy, healthy newborn plants often associated with the hippie days of the 1960s--have in this decade become regulars in salad bars and produce departments



across the country. But along with their increasing presence has come an increasing frequency of sprout-related food-borne illness.

The federal government has linked the most common kind--alfalfa sprouts--to a number of food-borne disease outbreaks, most occurring since 1995. The disease culprits included the bacteria *Salmonella* and *Escherichia coli* O157:H7, a particularly dangerous pathogen.

These outbreaks led the Food and Drug Administration in August 1998 to issue a health advisory for high-risk groups warning them not to eat raw alfalfa sprouts and, in September, to conduct a public hearing to determine what further steps, if any, are needed to ensure the safety of sprouts.

"There are some interesting questions raised about sprouts," says Karen Hulebak, a science policy analyst in FDA's Office of Policy. "What do we know about the source of sprout contamination? What should consumers do? ... There are a lot of uncertainties."

### **What Are Sprouts?**

Sprouts, which are the germinating form of seeds and beans, are easy to produce. They require no soil, only water and cool temperatures. They emerge in two to seven days, depending on the type of seed or bean. In addition to raw alfalfa sprouts, other varieties in-

clude clover, sunflower, broccoli, mustard, radish, garlic, dill, and pumpkin, as well as various beans, such as mung, kidney, pinto, navy and soy, and wheat berries. Many are sold individually, some in mixtures.

Potomac Glen Farms in Potomac, Md., sells a wide array. Each offers a distinct flavor, suggesting, as sprout growers like to point out, that sprouts indeed work well in a variety of dishes, such as soups, salads, sandwiches, and stir fries. Nancy Snider, owner of Potomac Glen Farms and president of the International Sprout Growers Association, says one of her favorite foods is sprouts with peanut butter and crackers.

While versatile, sprouts also are favored for their nutritional value. Like other fresh produce, sprouts are low in calories and fat and provide substantial amounts of key nutrients, such as vitamin C, folate and fiber. A 1997 Johns Hopkins University study suggested raw broccoli sprouts may be particularly rich in sulforaphane, a compound that may mobilize the body's natural cancer-fighting resources and reduce the risk of developing cancer.

Though popular in this country in only the past few decades, sprouts have actually been around for thousands of years. Mung beans have been used in Chinese foods for years--though usually in cooked dishes.

Today, sprouts in the United States are a \$250-million market. Some 475 U.S. sprout growers produce 300,000 tons of sprouts every year, according to the International Sprout Growers Association. As many as 10 percent of Americans eat sprouts regularly.

### **Foodborne Illnesses**

Sprouts have only recently emerged as a recognized source of food-borne illness. Since 1995, health officials have attributed 13 food-borne disease outbreaks worldwide to sprouts. Ten of these outbreaks occurred in the United States, resulting in illnesses in at least 956 Americans and at least one death.

Four of the outbreaks were caused by *E. coli* bacteria, and three of those involved the most dangerous strain, *E. coli* O157:H7. The biggest outbreak occurred in Japan in 1996; 9,000 people were sickened and 17 died after eating radish sprouts contaminated with *E. coli* O157:H7.

The O157:H7 strain produces toxin in the human gut that damages cells of the intestinal lining. This allows blood to pass into the stool. Other symptoms of O157:H7 infection are stomachache, nausea and vomiting. Infection can lead to hemolytic uremic syndrome (HUS), a major cause of acute kidney failure in children in this country. HUS is fatal in about 3 to 5 percent of cases.

Many of the outbreaks have involved raw alfalfa sprouts or mixed sprouts containing raw alfalfa sprouts contaminated with *Salmonella*.

In people, *Salmonella* can cause salmonellosis, an illness characterized by fever, stomach cramps, and diarrhea. The illness can last as long as seven days, and severe cases may require hospitalization. In some people, it can cause death. A small number of illnesses may develop into recurring joint pain and arthritis.

Where do these bacteria come from? It's believed that the seeds from which sprouts are derived are often the source. Some of the seeds may become contaminated by animals in the field or during post-harvest storage, for example. Also, the use of animal manure in fields of alfalfa intended for nonhuman use may be a problem if seed is used for sprouting.

The ideal conditions provided by germinating

seeds and beans--namely abundant nutrients in this phase of plant growth, high levels of moisture needed to produce sprouts, and heat generated from the sprouting process--help ensure the survival and growth of bacteria. "In the sprouting environment, bacteria can grow quickly," says Robert Wick, Ph.D., a plant pathologist with the University of Massachusetts and one of the presenters at FDA's September 1998 public hearing on sprouts.

So far, mishandling of sprouts during production, packing or distribution has not been implicated as the source of sprout contamination. However, bacteria already present in the sprouting seed can continue to thrive in conditions in which poor food handling techniques are practiced--for example, lack of refrigeration, infected workers, and dirty and unsanitary sprouting facilities.

### **Preventive Measures**

Following three 1998 food-borne disease outbreaks involving raw alfalfa sprouts, FDA in August reaffirmed a warning that had been issued by the national Centers for Disease Control and Prevention in 1997. The advisory urged people at high risk for severe food-borne disease--children, the elderly, and people with compromised immune systems--to avoid raw alfalfa sprouts until methods to improve the safety of sprouts can be identified and put in place.

In September, the agency held a two-day public meeting on sprout safety to learn, among other things, possible preventive measures to ensure safe sprouts. Representatives from the sprout industry and consumer groups, as well as scientists and regulators, presented information to the Fresh Produce Subcommittee of the National Advisory Committee on Microbiological Criteria for Food.

High on the list of possible strategies was decontamination of sprout seeds. The most promising method is chemical treatment with

calcium hypochlorite. It already is in use in California on an emergency basis, as approved by the state's environmental protection agency. FDA is working with the U.S. Department of Agriculture to get the treatment approved by the U.S. Environmental Protection Agency, which oversees use of chemicals on raw agricultural products, such as sprout seeds.

Irradiation, in which a measured dose of ionizing radiation is applied to a food product, appears to work well in decontaminating sprout seeds, especially when used in conjunction with calcium hypochlorite. Irradiation of sprout seeds would require FDA approval. (See "Irradiation: A Safe Measure for safer Food" in the May-June 1998 FDA Consumer.)

Heat treatment (the same as pasteurization) has limited appeal because there is such a fine threshold at which bacteria can be killed and germination not destroyed.

Other preventive measures would focus on production and distribution of sprouts. Possibilities include mandatory Hazard Analysis and Critical Control Point (HACCP) programs for sprout growers. HACCP focuses on identifying and preventing hazards, such as bacterial contamination, rather than relying on spot-checks of production processes and random sampling of finished products. Emphasis on good agricultural and manufacturing practices of sprouts also may help reduce the incidence of sprout-related food-borne disease outbreaks. Another option might be to include a list of safe handling practices or a mandatory warning on labels of sprout packages. The warning would echo FDA and CDC recommendations for high-risk groups.

According to LeAnne Jackson, Ph.D., a science policy analyst in FDA's Center for Food Safety and Applied Nutrition, the National Advisory Committee on Microbiological Criteria for Food was awaiting the subcommittee's recommendations at press time. If endorsed, the recommendations will be forwarded to

FDA for consideration.

In the meantime, the International Sprout Growers Association planned to begin in November 1998 a voluntary quality assurance program in which sprout growers agree to follow ISGA-established sanitation guidelines based on good manufacturing practices. According to ISGA president Snider, sprout growers that participate could label their products as ISGA-certified as long as their facilities pass inspection by a third-party auditor.

The sprout industry also is working with the National Center for Food Safety and Technology--a consortium of government, industry and academia devoted to food safety research--in Summit-Argo, Ill., to study sprout safety. The center is conducting a six-month research project to verify the effects of chemical, heat and irradiation treatment of seeds on sprout safety.

Snider says the industry is involved because it wants to reduce any hazards associated with sprouts. "This is a difficult time for us," she acknowledges. "But out of difficulties, something good can come. We expect [these concerns over sprout safety] to turn out to be our best friend. We want our products to carry zero risk."

## **How to Eat Sprouts Safely**

If you belong to one of the groups at high risk for food-borne disease--children, the elderly, and people with compromised immune systems--avoid raw alfalfa sprouts.

If you are a healthy adult, follow these tips:

- Buy only sprouts kept at refrigerator temperature. Select crisp-looking sprouts with the buds attached. Avoid musty-smelling, dark, or slimy-looking sprouts.
- Refrigerate sprouts at home. The refrigerator should be set at no higher

than 40 degrees Fahrenheit (4 degrees Celsius).

- Wash hands with warm water and soap for at least 20 seconds before and after handling raw foods.
- Rinse sprouts thoroughly with water before use. Rinsing can help remove

surface dirt. Do not use soap or other detergents. ❖

<b>Nutritional Value of a Cup of Raw Sprouts</b>						
	Calories	Protein	Fiber	Vitamin C	Iron	Folate
<b><i>Alfalfa</i></b>	10	1.3 grams	3%DV	5%DV	2%DV	3%DV
<b><i>Mung Bean</i></b>	26	2.5 grams	4%DV	23%DV	4%DV	9%DV
<b><i>Radish</i></b>	16	1.4 grams	n/a	18%DV	2%DV	9%DV
<b><i>Soybean</i></b>	86	1.3 grams	3%DV	5%DV	2%DV	3%DV
<b><i>Wheat</i></b>	214	8.0 grams	4%DV	5%DV	11%DV	10%DV
<i>Source: U.S. Department of Agriculture</i>						

# Recommended Guidelines for the Safe Handling and Storage of Swimming Pool Chemicals

*Compiled by Charles Rudnick, RS and Joel M. Hollis, RS  
Division of Community Sanitation*

*Note to Boards of Health: This is general information regarding the safe handling and storage of swimming pool chemicals. A similar document is available for distribution to pool operators.*

*Please contact the Division of Community Sanitation to request copies.*

The improper handling and storage of pool chemicals has the potential to contaminate the environment, cause destruction of property through fires and explosions, and cause serious personal injury and even death.

## Case Studies

- A man mixed incompatible pool chemicals, calcium hypochlorite and trichlor-s-triazetrione. He added the chemicals to a bucket of pool water containing algae and debris, resulting in an explosion that sent a white smoke cloud 30 feet into the air. The explosion caused chemical burns to his body and lungs. The man died as a result of these injuries.
- In 1988, a major chlorine fire occurred in Springfield Massachusetts at a chemical distribution plant. The fire was caused by rainwater leaking into a storage room that contained approximately 700 drums of solid chlorine pool chemicals. The fire lasted for three days, resulting in multiple explosions and the release of chlorine gas. Hundreds of people required hospital treatment for respiratory problems and skin burns and over 25,000 people were evacuated from the area.

## General Guidelines

Listed below are some general guidelines to follow for the safe handling and storage of pool chemicals. These guidelines are not a

comprehensive list of recommendations, the product label and the Material Safety Data Sheets (MSDS) for each chemical should be reviewed for specific details.

## Training

- The employer must have a Hazard Communication Training Program. Employers are required to inform and train employees regarding the presence of hazardous chemicals in the work area.
- Massachusetts General Law Chapter 111F requires that employers train employees who work with hazardous chemicals about the nature and effect of the hazardous substances in the workplace. Most pool chemicals are hazardous and/or toxic. The training must include a review of all MSDS for chemicals at the work site.

Material Safety Data Sheets (MSDS) include detailed information about specific chemicals and are provided by the manufacturer. Information in MSDS include the chemical name, hazards in the use of the product, list of incompatible chemicals, potential for a fire or explosion, health effects and risks of exposure, and the proper precautions, handling practices, and required personal protective gear for handling the chemical.

- Establish an emergency response plan and periodically run practice drills.
- Post all emergency phone numbers such as fire department, poison control center, and local medical facilities in conspicuous locations.

## Handling

### Personal Protection

- Always wear proper protective gear. Chemical goggles or face shields, appropriate respirators, rubber gauntlet gloves, acid/base aprons, and protective footwear should be provided and used. Refer to the MSDS for additional specific requirements.



- Provide and wear footwear with toe protection if carbon dioxide and other tanks are used.
- Warning signs should be posted reminding staff to wear protective gear.



- Wash hands after handling chemicals.
- Do not eat or drink while handling pool chemicals.
- Do not smoke while handling chemicals or in chemical storage areas. **No Smoking** signs should be posted.



- An eyewash station and a shower should be provided if employees handle liquid chlorine and/or hydrochloric acid.

### Using Chemicals

- Read and follow label instructions.
- Do not reuse empty containers.
- Use separate, clean, dry scoops for trans-

ferring each chemical.

- Always practice good housekeeping practices, contamination of pool chemicals from dirt, rags, and other debris can cause a fire.
- Never mix different pool chemicals together; they may explode and release dangerous gases.
- Do not add water to chemicals, violent reactions can occur. Add chemicals slowly to large quantities of water.
- When preparing a solution for a chemical feeder, add the disinfectant slowly to large amounts of water while stirring.
- Use only the chemical specified for the chlorine erosion feeder. Use of a different chemical may cause an explosion.
- Mixing dry pool chemicals with water, detergents or other liquids could result in a **fire** and the release of **toxic chlorine fumes**.
- Do not pour acid down a skimmer, it may react with chlorine in a chlorine erosion feeder resulting in chlorine gas production.
- Do not pour inorganic chlorine (e.g., calcium hypochlorite) into a skimmer if a chlorine erosion feeder containing "trichlor" (organic chlorine) is being used. These chemicals are incompatible with each other; mixing them can cause the feeder to explode. Erosion feeders should be turned off when adding other chemicals to the pool.
- Do not allow unneutralized chemicals and chlorinated materials into the sewer.
- **Do not add chemicals directly into pool when swimmers are present.**

### Storage

- Keep chemicals out of the reach of children and unauthorized individuals. Chemicals should be kept in a locked area.
- Keep chemical containers tightly sealed when not in use.
- Store pool chemicals in a cool, dry, well-ventilated area. Chemicals must not be exposed to direct sunlight.
- Chemicals should be stored off the floor on

pallets or shelving.

- Do not store liquids near **or especially above** solid chemicals.
- Do not store chemicals near a heat source such as a gas-fired hot water heater.
- Keep chemicals away from electrical equipment.
- Do not hose down the filter room or storage room with chemicals in it.
- Keep chemicals in their original containers.
- Label chemicals containers.
- Store incompatible pool chemicals as far away from each other as possible. Separate other chemicals including gasoline, fertilizers, solvents, flammable paints, oil, combustibles etc. Mixing could result in a **fire and explosion**. If space is limited, incompatible pool chemicals should be stored at least 4 feet apart. It is recommended that gasoline and other flammables be stored in a separate out building.
- Mark all chemical tanks and feed lines.
- Storage tanks of bulk liquid chlorine and tanks of hydrochloric acid should be enclosed in a secondary container that can contain 110% of the volume of the tank.
- Keep chlorine tanks and feed lines and hydrochloric acid feeding equipment as far apart as possible. Mixing of the chemicals, due to a spill or a burst line, could result in the production of chlorine gas fumes.



- The Fire Prevention Regulations (527 CMR) and the Massachusetts Building Code (780 CMR), regulate the storage of oxidizing pool chemicals. It is recommended that local Fire Department

Board of  
Prevention  
Regulations

and Building Inspectors conduct an inspection of the chemical storage areas.

### Spills

- Handle all spills correctly and quickly according to label instructions and the MSDS.
- Remove damaged containers promptly.
- Dispose of pool chemical containers in accordance with label instructions. Fires have started in trash containers that contained empty bags of chlorine and fertilizer bags thrown in the same container.
- Do not put spilled chemicals back into the container. Contamination from dirt or other debris could cause a fire.
- Do not use dry chemical fire extinguishers in extinguishing a chlorine fire.

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